Ad Hoc Expert Meeting on

Climate Change Adaptation for International Transport: Preparing for the Future

16 to 17 April 2019

Rail research into adapting to climate change - Tomorrow's Railway and Climate Change Adaptation (TRaCCA)

Presentation by

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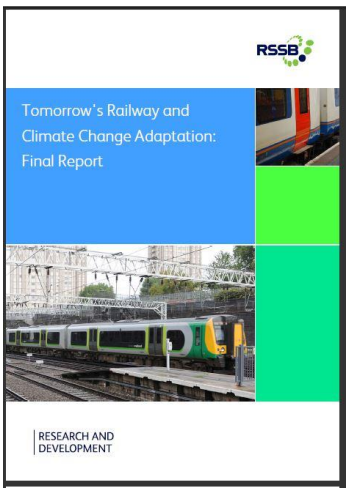
Presentation at UCTAD Meeting in Geneva

Tuesday 16 April 2019

Michael Woods, RSSB

My remit

- Today I will be describing the work done by RSSB for the rail sector in the UK in research project T1009: Tomorrow's Railway and Climate Change Adaptation.
- I will also cover integrated transport, systems, future challenges and the need to cooperate across modes.
- And explain what Network Rail is currently doing in this area.
- But first I will tell you about RSSB.



My remit

RSSB – the Rail Safety and Standards Board – provides a range of services for the national rail network of Great Britain (England, Wales, and Scotland)

- RSSB is
  - An independent, not-for-profit company whose decisions are derived through member consensus.
  - Established to actively help the industry to work together to drive improvements in the GB rail system.
  - Helping our members to continually improve health, safety and wellbeing performance.
  - We set industry standards and collect industry safety and health data to inform risk analysis and guidance.
  - Working with all parts of the rail industry, we have played a major role in making Britain's rail system one of the safest in Europe with no passenger train fatalities over the last 12 years.

Research, development and innovation

The cross-industry research programme was established in 2001 and initially focussed on research to achieve safety improvements in the industry. It has since evolved to support RSSB's evidence-based changes to standards and develop new safety risk tools. More recently the programme has also addressed:

- lower than desirable customer experience
- poor performance,
- insufficient capacity provision,
- overall **sustainability**, and
- high running costs.

It is largely funded by an annual government grant.

Sustainability

- We have been proactive in promoting sustainable development for the industry over many years
- Our remit is to embed the sustainable development principles across GB rail. The principles explain the key role that rail has to play in the economy, the environment and wider society
- We are currently working in areas such as air quality, decarbonisation, accessibility, the social impact of railways, and, of course, climate change adaptation

Winners announced in decarbonisation competition

09 April 2019

RSSB has announced the winners of the £1 million Intelligent Power Solutions to Decarbonise Rail competition.

The six feasibility studies funded through the RSSB competition will develop alternative, energy-efficient technologies for high speed trains and freight trains, and innovative solutions for the provision, storage and distribution infrastructure of energy.

Research into climate change adaptation

In 2016 we published an RSSB funded research study known as TRaCCA, in two phases, sponsored by the GB Technical Strategy Leadership Group.

- Phase 1: A comprehensive knowledge review and knowledge gap analysis off issues relating to climate change *adaptation* not *mitigation* relating to the rail industry
- Phase 2: Improving knowledge of climate change hazards and vulnerabilities, and proposing decision support tools to increase resilience of the GB railway

The reports and over 500 supporting documents are freely available in our SPARK web portal, which also hosts the UIC (International Union of Railways) research archive.

Go to www.sparkrail.org and register – free – for access to all these materials

Key questions

- How is the UK climate and weather going to change in the future?
- What are the impacts of climate change and extreme weather going to be on the GB railway?
- What is being done already or can be done about the impacts of climate change and extreme weather?
- How can we evaluate the cost and benefits of dealing with the impacts of climate change and extreme weather?

Findings - economics

How can we evaluate the cost and benefits of dealing with impacts of climate change and extreme weather?

Socio-economic benefits currently are not routinely assessed – we need to include them in all our future planning.

The Phase 2 case studies provide powerful illustrations.
A good example is the regular flooding at Cowley Bridge Junction in South West England.

Findings - changes

How is the UK climate and weather going to change in the future?

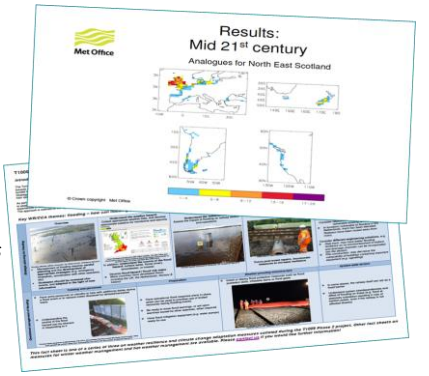
Looked at other climates and similar railways across the world

Britain's climate in 2080 will be similar to central France now

We expect warmer drier summers, milder wetter winters, and more frequent extreme weather events

…BUT…

Extremely cold winters will still be possible



Findings – action planning

What is being done already or can be done about the impacts of climate change and extreme weather?

GB railway seems to be ahead of many other railways in terms of managing risks due to climate variability and understanding the vulnerability of our assets

We are at the forefront of adaptation and resilience planning and implementation – but there is still much to be done

- Network Rail climate change adaptation plans
- Climate change resilience steering group
- Review of standards and specifications for critical assets

The next slides show details of Network Rail's current Weather Resilience and Climate Change Adaptation plans

Adapting the railway to climate change

Infrastructure able to withstand the impact of future weather conditions

WRCCA Policy
Consider how climate change might amplify risk
Adapt at construction and at asset renewal
Replace like for better rather than like for like

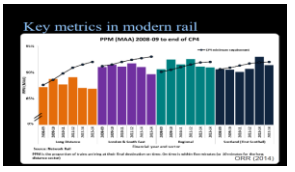
Integrate CCA in NR	WRCCA Plans	WRCCA Strategy
Embed climate change within policies, procedures and standards: • Asset Policies and Standards • Environment and Social Requirements • GRIP • Investment Processes	• Route WRCCA Plans to be updated for CP6 • Asset specific WRCCA Plans in development • ORR to monitor progress of implementation	• Initiating development of long term climate change strategy • Industry wide involvement • Based on business drivers

Pillars of Resilience

WRCCA in CP6

Findings - new metrics needed

Prototype metrics have been proposed



How can we evaluate the cost and benefits of dealing with impacts of climate change and extreme weather?

Need better metrics to assess the resilience of the railway as part of a wider transport system

New asset vulnerability tools have been demonstrated

Ultimately there is a need to develop metrics for transport as a system to help across different transport modes

'Delay minutes may not accurately reflect how regularly a route is not available for full service. We need a different mechanism.'

Mark Phillips, RSSB, quoted in 'Rail' 22 June 2016.

Findings - impact on asset life

What are the impacts of climate change and extreme weather going to be on the GB railway?

Changes will be required to railway standards and asset policies

Cannot rely on past weather for future design and maintenance
It is easier to adapt at asset renewal stage

Need to assess *current vulnerabilities – tools demonstrated based upon systems thinking and mapping*

Hundreds of GIS (Global Information System) mapping-based tools reviewed

Develop GIS-based alert systems and weather susceptibility maps

Findings - interdependencies are important

How can we evaluate the cost and benefits of dealing with impacts of climate change and extreme weather?

Infrastructure systems are inter-dependent, requiring a multi-agency response to climate change

- Better collaboration needed across the infrastructure sector
- Seek to establish multi-agency weather strategic and operational planning and to reinforce multi-agency communication processes
- Introduce multi-agency communications systems
- Adopt decision-making criteria about rail line closures which take into account customer preferences

This issue is key to the theme of this UNCTAD event and is to be developed further in my next slides.

Interdependencies within transport

In many countries, transport is managed modally, often with conflicting plans and funding arrangements for private road networks, buses, trains and metros plus trucks and other goods vehicles, plus the maritime and aviation sectors.

Trains, coaches and airlines are often seen as competing for passengers, and the logistics supply chain is also characterised by competition.

But there are also good examples of complementary activities where private cars feed into public transport networks and freight systems such as combined transport where ships, rail and road vehicles carry container traffic.

And during extreme weather conditions we have to rely on each other to get the passengers and essential supplies home.

For example, if the roads and railways are not running due to snow, the pilots and other staff can't maintain air services, fuel and goods cannot get through….

Interdependencies

Drax Port to Power Station Case Study (1)

- As part of TRaCCA we studied how electricity generation is dependent on the uninterrupted flow of biomass (wood pellets) from the port of Immingham to Drax Power Station, and the relationships with neighbours and other agencies which need to be understood and managed.
- Since our case study Drax has added security to its supply chain by shipping via Hull, Liverpool and Tyne – but the principles still apply.

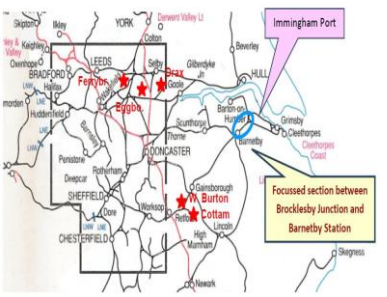


Figure 1. Case study area and the focussed section

Note that red stars indicate major power stations. The blue circle indicates the focussed section. The red lines signify East Coast Main Line and major branch lines. The figure was created from the diagrams of Trackmaps (2006)

Ferrybridge and Eggborough Coal-Fired Power Stations have since closed

Interdependencies

Drax Port to Power Station - Case Study (2)

Unlike coal, biomass traffic is time-critical. Like other commodities it can be vulnerable to:

- Socio-political, strategic, operational and local/ and specific events
- Interactions with electrical power supply, fuel supply, water systems (including managed water networks, surface and groundwater), other transport systems and supply chains, and the natural environment
- Other users of the rail network and events such as train derailments, and impacts from flooding, landslips, signalling failures etc
- The road network, especially from bridge strikes by trucks or buses
- Gradual degradation or condition change (eg water leakage) impacting on the railway system

- These can be made worse by the effects of climate changes such as buckled rails, more flooding, more embankment or other earthworks slips; storm surges or coastal flooding or heat impacts on electrical and electronics affecting signalling systems.

Interdependencies

Drax Port to Power Station - Case Study (3)

- Rail is the only effective transport mode for biomass and is far less carbon intensive than the alternatives. Drax has an average of 17 biomass trains arriving at the power station carrying up to 20,000 tonnes of biomass each day. The roads would not cope if the rail route was closed completely.
- Potential solutions can include better knowledge of the most vulnerable assets; multi-agency working with rail liaising with the owners of neighbouring assets such as farmland, the road network, water courses and urban areas. And communications systems are key to this, both for planning and 'on the day'.
- It is useful to understand the vulnerabilities of end-to-end supply chain partners from the initial manufacture / cropping of biomass, through to maritime operations, port management including cargo and train handling, the rail network itself and the power station end users and how these can be managed in business as usual as well as disturbed or emergency situation including climate change

Interdependencies

Drax Port to Power Station - Case Study (4)

Key rail assets, as they become ready for renewal, need to be proofed against changes in climate, probably with little real incremental cost.

Wider interfaces, such as those with road, communications, power, and water networks also need to be upgraded in time to cater for expected weather changes.

The relationship with adjacent land use – city – urban – rural – must also be taken into account.

Summary – next steps

The rail industry is a key player in the UK supply chain, carrying between 8%-10% of UK freight.

However it relies upon road transport for final distribution of goods, and ports where deep sea containers and other commodities enter the country.

As an island we are particularly reliant on our external supply chains.

RSSB is particularly pleased to hear of this UNCTAD initiative – as we all need to work together across modes to bring better sustainability where each mode can play to its strengths and recognise others' contributions in the face of an uncertain future.

We're happy to continue engaging and keen to hear more and work tomorrow during breakout session - how can we help to get the UN messages to transport operators?

Media interest

Climate change… the impact on rail

There is unequivocal evidence that Britain's railway will be affected by climate change. A new report by the RSSB sets out what will happen, and calls for long-term spending. PAUL CLIFTON reports

Higher temperatures, more frequent and more extreme weather events, and rising sea levels create risks for railway staff, passengers and operations. That is the conclusion of the RSSB (Rail Safety and Standards Board), at the end of a two-year investigation.

There will be more disruption to rail operations, more damage to railway infrastructure, and more negative impact on people's health and wellbeing.

"We recognise that climate change is a big issue for the railway, and we need to consider now how to prepare for it," says Mark Phillips, interim managing director of RSSB.

"By 2050-2080 the English climate will be similar to that of central France today. And there will be more events like the recent flash flooding in Carlisle and York. With that knowledge we can develop specific actions to protect our assets."

The report is aimed at the industry's decision makers: Network Rail chief Executive Mark Carne, the managing directors of train operating companies, and the civil service mandarins at the top of the Department for Transport.

The average cost of weather-related disruption is now £40 million to £50m a year. And that's just the price of delays and cancellations - the cost of repairs comes on top of that.

Flooding in 2013 alone cost NR £12m in compensation and a further £25m to damage repairs. Meanwhile, the cost of track buckling in hot weather - £4.8m a year - is expected to

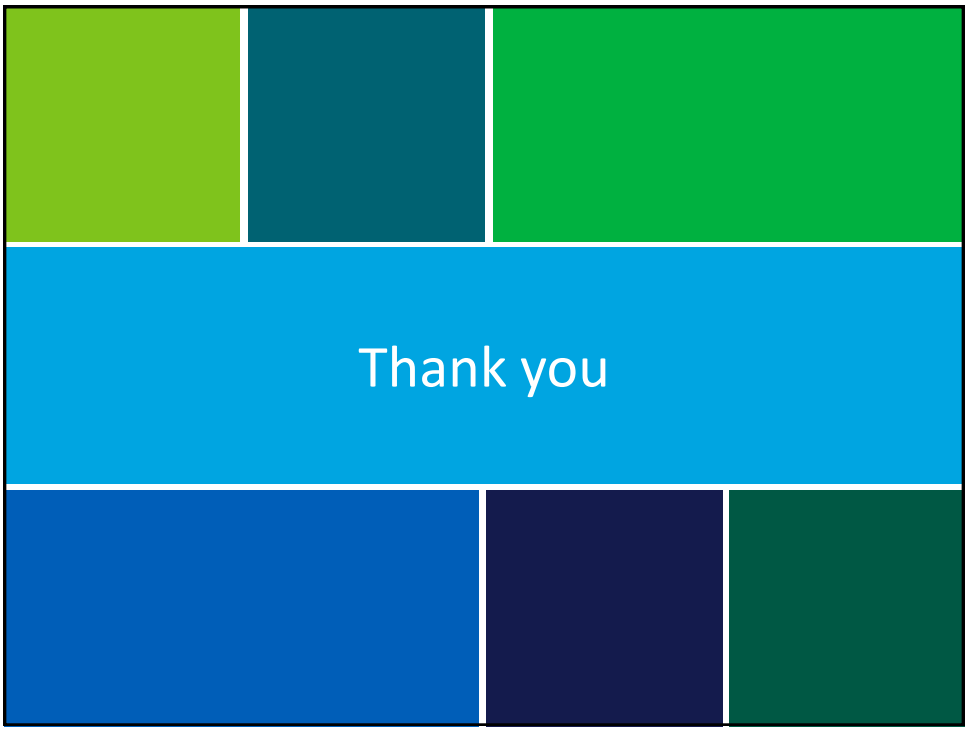
And finally – an article in Future Rail

THREATENING WEATHER FOR THE UK

UK RAILWAYS SUFFER IN EXTREME WEATHER, OFTEN RESULTING IN DELAYS, CANCELLATIONS OR SHUTDOWNS OF LINES AND STATIONS. *GARY PETERS* ASKS WHETHER THE INDUSTRY IS PREPARED FOR THE EFFECTS OF CLIMATE CHANGE ON NATIONAL NETWORKS

"If you don't have any bad weather for years and years, people say 'oh well it's not a problem, hasn't happened, we don't need to invest in that area'." Heavy rainfall and rising temperatures "concentrate people's minds and remind them how vulnerable all these networks are", Woods adds.

Woods advocates a change of approach: "Railways, like roads, have to justify money that's spent on them. Now, if you only take into account the benefits and costs to the railway industry, you miss a lot of the benefits, and maybe some of the cost, which apply to the people outside the industry: our neighbours."


Thank you